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## Water contents of natural zircons are controlled by their Y+REE contents

J.C.M. DE HOOG<sup>1\*</sup>, C.J. LISSENBERG<sup>2</sup>,  
R.A. BROOKER<sup>3</sup>, R.W. HINTON<sup>1</sup>, D. TRAIL<sup>4</sup>,  
E.W.G. HELLEBRAND<sup>5</sup>

<sup>1</sup>School of GeoSciences, Univ. Edinburgh, EH9 3FE, UK

(\*correspondence: ceesjan.dehoog@ed.ac.uk)

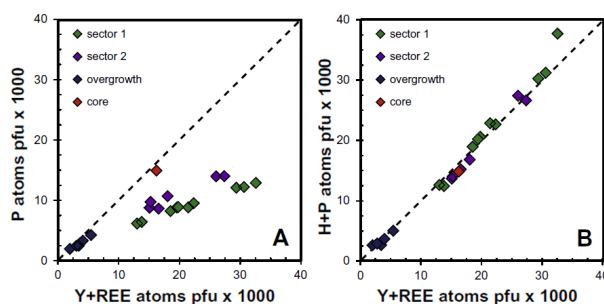
<sup>2</sup>School of Earth and Ocean Sciences, Cardiff Univ., UK

<sup>3</sup>School of Earth Sciences, Univ. Bristol, UK

<sup>4</sup>Dept. Earth and Envir. Sciences, Univ. Rochester, USA

<sup>5</sup>Dept. of Geol. and Geoph., Univ. Hawai'i at Mānoa, USA

The water and trace element contents of non-metamict igneous zircons were determined to constrain the H incorporation mechanism and to evaluate the use of zircon to constrain water contents of melts [1]. Zircons from Fe-Ti oxide gabbros from the Vema Fracture Zone [2] contain up to 980 ppm H<sub>2</sub>O, 1.4 wt% Y<sub>2</sub>O<sub>3</sub> and 0.6 wt% P<sub>2</sub>O<sub>5</sub> and are generally strongly zoned. Y+REE are partially charge-balanced by P ( $Y^{3+}+P^{5+}=Zr^{4+}+Si^{4+}$ ) but a large Y excess is present (Fig. 1A). On an atomic basis, this excess closely matches the amount of H present in the zircons (Fig. 1B). We therefore conclude that H is incorporated by a charge-balance mechanism ( $H^{+}+Y^{3+}=Zr^{4+}$ ). This is supported by FTIR data, which show a strongly polarised absorption band at 3100 cm<sup>-1</sup> similar to experimental Lu-doped hydrous zircons. No other absorption bands are visible, excluding a hydrogrossular-type exchange mechanism. Because of charge-balanced uptake of H, P and Y+REE in zircon, the partitioning of these elements into zircon is dependent on each of their concentrations. Hence, using H in zircon to determine water contents of melts is challenging. As Ce<sup>4+</sup> partitioning is not affected, Ce anomalies may depend on H<sub>2</sub>O and P<sub>2</sub>O<sub>5</sub> contents of the melt, in addition to its oxidation state [3].



**Figure 1:** (A) P vs Y+REE (B) H+P vs Y+REE

[1] De Hoog *et al.* (2014) *Geoch Cosmoch Acta* **141**, 472-486.

[2] Lissenberg *et al.* (2009) *Science* **323**, 1048-1050. [3] Trail

*et al.* (2012) *Geoch Cosmoch Acta* **97**, 70-87.